CLAIMS

1. A magnetic head, comprising:

a substrate base;

a write head being fabricated above said substrate base, including:

at least two magnetic poles;

an electrical insulation layer being disposed between said magnetic poles such that no portion of said electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

a fill layer being disposed around said electrical insulation layer such that portions of said fill layer are disposed at said ABS surface;

an induction coil being disposed within said electrical insulation layer.

2. A magnetic head as described in claim 1 wherein said electrical insulation layer is composed of a substance selected from the group consisting of hard baked resist and SiO_2.

3. A magnetic head as described in claim 2 wherein said induction coil is a single layer induction coil.

4. A magnetic head as described in claim 2 wherein said induction coil is a multiple layer induction coil, and wherein each layer of said multiple layer coil is disposed within a separate electrical insulation layer, and each said electrical insulation layer is disposed within a separate

fill layer, and wherein no portion of either said electrical insulation layers is disposed at said ABS surface, and wherein portions of each said fill layer are disposed at said ABS surface.

5. A magnetic head as described in claim 1 wherein said fill layer is comprised of Al_2O_3.

6. A magnetic head as described in claim 5 wherein said etch stop layer is comprised of Al_2O_3.

7. A magnetic head, comprising:

a substrate base;

a first magnetic pole (P1) being disposed above said substrate base;

a P1 pole pedestal being disposed upon said P1 pole;

an etch stop layer being disposed upon said P1 pole;

an electrical insulation layer being disposed upon said etch stop layer, said electrical insulation layer being patterned such that no portion of said electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

a fill layer being disposed around said electrical insulation layer such that portions of said fill layer are disposed at said ABS surface;

an induction coil being disposed within said electrical insulation layer;

a write gap layer being disposed above said fill layer;

a second magnetic pole (P2) being disposed upon said write gap layer.

8. A magnetic head as described in claim 7 wherein said electrical insulation layer is comprised of a material selected from the group consisting of an organic polymer and SiO_2.

9. A magnetic head as described in claim 8 wherein said fill layer is comprised of Al_2O_3.

10. A magnetic head as described in claim 9 wherein said etch stop layer is comprised of Al_2O_3.

11. A magnetic head, comprising:

a substrate base;

a first magnetic pole (P1) being disposed above said substrate base;

a write gap layer being disposed above said P1 pole;

a P2 pole tip being disposed above said write gap layer;

an electrical insulation layer being disposed above said write gap layer, said electrical insulation layer being patterned such that no portion of said electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

a fill layer being disposed around said electrical insulation layer such that portions of said fill layer are disposed at said ABS surface;

an induction coil being disposed within said electrical insulation layer;

a second electrical insulation layer being disposed above said induction coil;

a P2 pole yoke being disposed above said second electrical insulation layer.

12. A magnetic head as described in claim 11, wherein said electrical insulation layer is composed of a substance selected from the group consisting of an organic polymer and SiO_2.

13. A magnetic head as described in claim 12, wherein an etch stop layer is disposed on portions of said write gap layer, and said electrical insulation layer is disposed upon said etch stop layer.

14. A magnetic head as described in claim 13 wherein said fill layer is comprised of Al_2O_3.

15. A magnetic head as described in claim 14 wherein said etch stop layer is comprised of Al_2O_3.

16. A magnetic head, comprising:

a substrate base;

a first magnetic pole (P1) being disposed above said substrate base;

a P1 pole pedestal being disposed upon said P1 pole;

a first etch stop layer being disposed upon said P1 pole;

a first electrical insulation layer being disposed upon said etch stop layer, said first electrical insulation layer being patterned such that no portion of said first electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

a first fill layer being disposed around said first electrical insulation layer such that portions of said first fill layer are disposed at said ABS surface;

a first induction coil layer being disposed within said first electrical insulation layer;

a write gap layer being disposed above said first fill layer;

a P2 pole tip being disposed above said write gap layer;

a second electrical insulation layer being disposed above said write gap layer, said second electrical insulation layer being patterned such that no portion of said second electrical insulation layer is disposed at said ABS surface of the magnetic head;

a second fill layer being disposed around said second electrical insulation layer such that portions of said second fill layer are disposed at said ABS surface;

a second induction coil layer being disposed within said second electrical insulation layer;

a third electrical insulation layer being disposed above said second induction coil layer;

a P2 pole yoke being disposed above said third electrical insulation layer.

17. A magnetic head as described in claim 16, wherein said first and second electrical insulation layers are composed of a substance selected from the group consisting of an organic polymer and SiO_2.

18. A magnetic head as described in claim 16, wherein a second etch stop layer is disposed on portions of said write gap layer, and said second electrical insulation layer is disposed upon said second etch stop layer.

19. A magnetic head as described in claim 18 wherein each said fill layer is comprised of Al_2O_3.

20. A magnetic head as described in claim 19 wherein each said etch stop layer is comprised of Al_2O_3.

21. A hard disk drive comprising:

a motor for rotating a spindle;

a magnetic medium disk mounted on said spindle;

an actuator assembly including a magnetic head for writing magnetic information on said disk, said magnetic head including:

a substrate base;

a write head being fabricated above said substrate base, including:

at least two magnetic poles;

an electrical insulation layer being disposed between said magnetic poles such that no portion of said electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

a fill layer being disposed around said electrical insulation layer such that portions of said fill layer are disposed at said ABS surface;

an induction coil being disposed within said electrical insulation layer.

22. A hard disk drive as described in claim 21 wherein said electrical insulation layer is composed of a substance selected from the group consisting of an organic polymer and SiO_2.

23. A hard disk drive as described in claim 21 wherein said electrical induction coil is a single layer induction coil.

24. A hard disk drive as described in claim 21 wherein said induction coil is a multiple layer induction coil, and wherein each layer of said multiple layer is disposed within a separate electrical insulation layer, and each said electrical insulation layer is disposed within a separate fill layer, and wherein no portion of either said electrical insulation layer is disposed at said ABS surface, and wherein portions of each said fill layer are disposed at said ABS surface.

25. A method for fabricating a magnetic head, comprising the steps of:

fabricating a write head above a substrate base, including the steps of:

fabricating a first magnetic pole;

fabricating an electrical insulation layer above said first magnetic pole, such that no portion of said electrical insulation layer is disposed at an air bearing surface (ABS) of the magnetic head;

fabricating a fill layer around said electrical insulation layer, such that portions of said fill layer are disposed at said ABS surface;

fabricating an induction coil within said electrical insulation layer;

fabricating a second magnetic pole above said induction coil.

26. A method for fabricating a magnetic head as described in claim 25 wherein said electrical insulation layer is composed of a substance selected from the group consisting of an organic polymer and SiO_2.

27. A method for fabricating a magnetic head as described in claim 25 wherein said induction coil is a single layer induction coil.

28. A method for fabricating a magnetic head as described in claim 25 wherein said induction coil is a multiple layer induction coil, and wherein each layer of said multiple layer coil is fabricated within a separate electrical insulation layer, and each said electrical insulation layer is fabricated within a separate fill layer, and wherein no portion of either said electrical insulation layer is fabricated at said ABS surface, and wherein portions of each said fill layer are fabricated at said ABS surface.

29. A method for fabricating a magnetic head as described in claim 26 wherein said fill layer is comprised of Al_2O_3.

30. A method for fabricating a magnetic head as described in claim 29 wherein said etch stop layer is comprised of Al_2O_3.

31. A method for fabricating a magnetic head, comprising the steps of:

fabricating a first magnetic pole (P1) upon previously fabricated elements of the magnetic head;

fabricating a P1 pole pedestal upon said P1 pole in magnetic connection therewith;

fabricating an etch stop layer upon said P1 pole;

fabricating an electrical insulation layer upon said etch stop layer, said electrical insulation layer being patterned such that no portion of said electrical insulation layer is deposited at an air bearing surface (ABS) of the magnetic head;

depositing a fill layer upon and around said insulation layer, portions of said fill layer being disposed at said ABS surface;

fabricating an induction coil within said electrical insulation layer;

fabricating a flat upper surface upon said P1 pedestal and induction coil;

fabricating a write gap layer upon said flat surface;

fabricating a P2 pole, upon said write gap layer.

32. A method for fabricating a magnetic head as described in claim 31 including the further steps of fabricating a patterned etching mask upon said electrical insulation layer, and conducting a reactive ion etch process to etch said induction coil trenches into said electrical insulation layer.

33. A method for fabricating a magnetic head as described in claim 31 wherein said etch stop layer is comprised of Al_2O_3, and said electrical insulation layer is comprised of a material selected from the group consisting of an organic polymer and SiO_2.

34. A method for fabricating a magnetic head as described in claim 31 wherein said electrical insulation layer is comprised of an organic polymer and including the further steps of

removing said organic polymer following said step of depositing said fill layer; and

depositing an SiO_2 electrical insulation layer in place of said organic polymer; and

fabricating said induction coil within said SiO_2 electrical insulation layer.

35. A method for fabricating a magnetic head as described in claim 34 wherein said fill layer is comprised of Al_20_3.

36. A method for fabricating a magnetic head, comprising the steps of:

fabricating a P1 pole layer upon previously fabricated elements of a magnetic head;

fabricating a P1 pole pedestal upon said P1 pole in magnetic connection therewith;

fabricating a first etch stop layer upon said P1 pole;

fabricating a first electrical insulation layer upon said etch stop layer, said first electrical insulation layer being patterned such that no portion of said first electrical insulation layer is deposited at an air bearing surface (ABS) of the magnetic head;

depositing a first fill layer upon and around said first insulation layer, portions of said first fill layer being disposed at said ABS surface;

fabricating a first induction coil layer within said first electrical insulation layer;

fabricating a flat upper surface upon said P1 pedestal and first induction coil layer;

fabricating a write gap layer upon said flat surface;

fabricating a second electrical insulation layer above said write gap layer, said second electrical insulation layer being patterned such that no portion of said second electrical insulation layer is deposited at an air bearing surface (ABS) of the magnetic head;

depositing a second fill layer upon and around said second electrical insulation layer, portions of said fill layer being disposed at said ABS surface;

fabricating a second induction coil layer within said second electrical insulation layer;

fabricating a third electrical insulation layer above said second induction coil layer;

fabricating a P2 pole yoke above said third electrical insulation layer.

37. A method for fabricating a magnetic head as described in claim 36 including the further steps of fabricating a patterned etching mask upon each said first and second electrical insulation

layers, and conducting a reactive ion etch process to fabricate said first and second induction coil layers within said first and second electrical insulation layers respectively.

38. A method for fabricating a magnetic head as described in claim 36 wherein said first and second etch stop layers are comprised of a Al_2O_3; and wherein said first and second electrical insulation layers are comprised of a material selected from the group consisting of an organic polymer and SiO_2.

39. A method for fabricating a magnetic head as described in claim 36 wherein said first and second electrical insulation layers are comprised of an organic polymer, and including the further steps of:

removing each said first and second organic polymer electrical insulation layers following said step of depositing a fill layer; and

depositing an SiO_2 electrical insulation layer in place of each said first and second organic polymer electrical insulation layers; and

fabricating said first and second induction coils within said SiO_2 electrical insulation layers.

40. A method for fabricating a magnetic head as described in claim 39 wherein said first and second fill layers are comprised of Al_20_3.